

Review of Psychological and Personality Variables. The sentence describing the (143) Thomas article does not do justice to her excellent discussion. The article is reproduced in its entirety because it discusses another way of interpreting association between cigarette smoking and coronary heart disease.

ON CIGARETTE SMOKING, CORONARY HEART DISEASE, AND THE GENETIC HYPOTHESIS¹

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What is the basis for the association between cigarette smoking and coronary heart disease? Although coronary disease is the most frequent cause of death in the United States today, and the majority of men smoke cigarettes, the answer to this question is still obscure. In 1956, Doll and Hill reported a significant statistical relationship between cigarette smoking and death from coronary disease which has been confirmed by other prospective studies (1-8). The difference between smokers and nonsmokers in respect to coronary disease mortality is relatively small, however, compared to the ten- to twentyfold differences often noted in respect to deaths from lung cancer in the prospective studies reviewed by the Advisory Committee to the Surgeon General of the Public Health Service (9, page 161, Table 5). In contrast, the median mortality ratio for coronary disease was 1.7 (range 1.5 to 2.0) for seven prospective studies of smokers and nonsmokers (9, page 323).

Many people have concluded that a causal relationship between cigarette smoking and coronary disease has, therefore, been established, but some have pointed out that such an association could be equally well explained on the grounds that 1) smokers are constitutionally different from nonsmokers, so that smoking cigarettes gives them more of a physiological or psychological boost and 2) cigarette smokers are more often the precoronary type of individual than nonsmokers. There have been scattered pieces of evidence that this may, indeed, be the case (10-16). At the time of the Surgeon General's report, these were sufficient to warrant the statement that "male cigarette smokers have a higher death rate from coronary artery disease than non-smoking males, but it is not clear that the association has causal significance." (9, page 327).

In examining the evidence that the statistical association between cigarette smoking and coronary heart disease may not be a simple cause-and-effect relationship, two facets of the genetic hypothesis,

- 1) that cigarette smokers are constitutionally different from nonsmokers, and
- 2) that individuals with a high risk of developing coronary heart disease are constitutionally different from those with a low risk,

can profitably be considered together. Although the implications are basically genetic, the term "constitutional" is used here rather than "genetic" because most measurements of adult men, whether physical or psychological, represent the phenotype, or manifest characteristics of the individual resulting from the interaction of his genotype, or genetic make-up, and the environment. The degree to which the environment interacts with the genetic component varies greatly according to the trait under consideration and the particular external circumstances. Certain traits, such as the blood groups, are not known to be modifiable by natural means. Others, such as stature, are modified only under

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such adverse conditions as severe undernutrition, while the proportionate roles played by genetics and environment in such characteristics as body weight, arterial blood pressure, total serum cholesterol level and personality structure are still being vigorously debated (17-29). While the genetic hypothesis does not necessarily contradict the various environmental hypotheses, it does limit them and diminish their importance by asserting that not all individuals are equally susceptible to adverse environmental influences.

Reports of actual genetic studies in this area are limited in number. Differences have been found in the distributions of such genetic markers as the blood groups and the ability to taste phenylthiourea (P.T.C.) in populations of smokers and nonsmokers; these findings are in harmony with the genetic hypothesis (12, 15). Twin studies carried out abroad point in the same direction. Monozygotic twins showed a higher degree of concordance than dizygotic twins in regard to smoking habits (30). In monozygotic twins with discordant smoking habits, coronary disease was not more frequent among the smokers than among the nonsmokers (31, 32). The numbers involved in these comparisons were too small, however, for definitive statistical evaluation.

Somatic variables reported to show statistically significant smoker-nonsmoker differences range from a series of anthropometric measurements to resting heart rate and blood pressure (13, 14, 16). The mean differences in all of these comparisons have been small, however, and at times have varied in direction from study to study, as in the case of weight (14, 16). Moreover, the small circulatory differences observed could well be the result of the smoking habit rather than a true constitutional difference.

Perhaps the most thought-provoking smoker-nonsmoker differences lie in the psychological area. There is a considerable body of evidence to show that the personality of smokers differs from that of nonsmokers in important ways (33-38). In the words of Eysenck, 1) "smokers tend to be more emotional, more neurotic, more given to anxieties, more tense, more likely to suffer from the so-called psychosomatic symptoms" than nonsmokers, and 2) "smokers tend to be more extroverted, nonsmokers more introverted.—Extroverted people tend to be sociable, to like parties, to value good food, drink and the good things of life generally—to take risks more readily, to act without regard to consequences, and to find it difficult to stick to the same task day after day" (39). Schubert has emphasized the point that the smoker seeks physiological, social and psychological arousal (40). His findings among college students, based on the Minnesota Multiphasic Personality Inventory, revealed that, compared with nonsmokers, smokers more frequently describe themselves as 1) being bored and seeking thrills, 2) behaving in a socially unacceptable fashion, and 3) having masculine traits. Smokers also scored higher on an impulsivity scale.

Work from our own laboratory indicates that psychological smoker-nonsmoker differences are of considerable importance. As part of a long-term prospective study of the precursors of hypertension and coronary disease, discriminant function analysis was used to test the hypothesis that cigarette smokers are different from nonsmokers in a number of psychobiological ways (41). The overall differentiation between nonsmokers and two groups of cigarette smokers in a population of male medical students was found to be highly significant.

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Cigarette smokers had substantially greater *anxiety* scores² than nonsmokers; *heart rate* and *anxiety* showed the greatest discriminatory powers among the seven variables used. *Cholesterol* and *pulse pressure* contributed to the differentiation to a lesser degree, with *anger* close behind. These findings, taken with those of others cited above, suggest that outstanding characteristics differentiating cigarette smokers from nonsmokers reside in the realm of personality.

It was, therefore, intriguing to find that *anxiety* was the most important variable in a similar discriminatory analysis based on parental history of coronary heart disease (13). Virtually the same population and variables were used; in particular, the measure of *anxiety* employed in the two analyses was identical. Again, the overall differentiation was highly significant. On the average, the group with *fathers* affected by coronary heart disease reported a *higher* anxiety level than did the group with both parents unaffected, whereas the group whose *mothers* had coronary heart disease had *lower* anxiety scores than the group with two unaffected parents. *Depression* was significantly less evident in both positive-parent groups. Although they aided in the discrimination, *anger*, *diastolic pressure*, *height* and *cholesterol level* made much smaller contributions.

From these two discriminatory analyses, several striking points emerge:

1. the same psychological characteristic, *anxiety*, was an important single variable in differentiating cigarette smokers from nonsmokers and in distinguishing subjects with a positive parental history of coronary disease from subjects without such a history,
2. the two criterion groups of smokers, which were selected on a quantitative basis in respect to number of cigarettes smoked a day, did *not* have significantly different characteristics from each other, and
3. the two groups with a positive parental history of coronary disease fell on opposite sides of the negative parental coronary disease group in respect to their mean anxiety scores.

Since a rather simply-derived anxiety scale proved to be a highly significant variable in both the smoker-nonsmoker differentiation and the discrimination between groups with and without parental coronary disease, the interesting possibility is raised that the link between cigarette smoking and coronary heart disease has to do with *anxiety* under stress. Does other research about the coronary personality tend to support this hypothesis?

More than twenty years ago, Dunbar described the personality profile of patients with coronary occlusion as one of compulsive striving, with an urge to get to the top through hard work, self-discipline and mastery of others (14). Her sub-

²Anxiety scores were based on the answers given by 1065 medical students to a questionnaire specially devised for the Study of the Precursors of Hypertension and Coronary Disease (11, 42). The questionnaire consists of a list of 25 habits of nervous tension (HNT); the subject was asked to check all the reactions or types of behavior characteristic of him when under stress. Patterns of response to stress were determined by means of a phi correlation matrix; scales were derived from the HNT items showing the highest degrees of association with each other. The reactions comprising the anxiety scale consist of *anxious feelings*, *general tension*, *difficulty sleeping*, *loss of appetite*, *tremulousness* and *urge to confide*, all of which showed significant positive correlations, and *urge to eat*, which was negatively correlated (11, p. 183). The anxiety scale scores, therefore, ranged from +6 to -1.

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jects were hospitalized patients under the age of 55. She came to her conclusions through psychiatric interviews supplemented by the Rorschach Test.

Since that time, there has been little agreement in regard to a psychodynamic personality pattern associated with coronary disease (15). There are some indications, however, that there may be two major coronary personality patterns which are diametrically opposed to each other. Bahnon and Wardwell, using home interviews plus self-administered check lists, studied 32 white men aged 35-64, who had survived their first attacks of myocardial infarction, and compared them with a control group (16). They found some differences between the coronary patients and the control group in respect to their feelings and attitudes toward their parents. The coronary group, however, resolved itself into two discrete subgroups which were almost the opposite of each other: the self-oriented, regressive type corresponding to the mother-oriented coronary patient ($N = 19$) and the socio-centric and controlled type corresponding to the father-oriented patient ($N = 13$).

The mother-oriented group showed the following characteristics:

1. they identified with their mothers in terms of her personal manners and intimate behavior identification
2. they were among the younger coronary patients
3. they were passive, stating that they frequently day-dreamed or "sat and did nothing", often lacking interest in and commitment to work
4. they showed dependency by tending to turn to others for help when in trouble
5. they were not compulsive and showed little concern over "face"
6. they had strong succorant needs
7. they had low ego strength and self-acceptance
8. they were unstable in that they often felt mixed-up, tense and worried
9. they showed a trend toward anxiety and depression
10. they frequently made use of regressive defenses
11. they showed insufficient control of aggression.

The father-oriented patients, on the other hand, showed the following characteristics:

1. they identified with their fathers through somatic and social image identification
2. they were among the older coronary patients
3. they were active and self-reliant
4. they showed strong compensatory socio-centric needs for achievement
5. they had considerable self-control and ego strength, with high self-acceptance and self-esteem
6. they clung to social norms
7. they had concern over "face"
8. they resorted frequently to the use of compulsive and repressive defenses in order to perform as solid citizens in spite of an unsatisfactory underlying self-image
9. their social commitment represented a flight from themselves.

Both the mother-oriented and the father-oriented coronary patients were considered by the authors to have failed in establishing their own identities in a satisfactory manner.

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In 1964, Ostfeld and his co-workers reported a four-year follow-up of a prospective epidemiological study of coronary heart disease in which the Minnesota Multiphasic Personality Inventory and the 16 Personality Factor Questionnaire were used to obtain measures of personality in men 40-55 years of age at the start (47). They found personality differences between the 48 men who, since being registered in the study, had developed symptoms of angina pectoris and the 37 men who had had myocardial infarctions. (They did not give the mean ages of their groups). On the average, the 1771 men who had remained free of clinical coronary disease showed personality profiles which lay *between* the angina pectoris group and the myocardial infarction group. Their findings indicated that the men in the angina group complained significantly more about somatic symptoms of all sorts and worried significantly more about the state of their health, even in the absence of objective findings, than the men in the infarct group. The angina group also reported greater lability in cardiovascular functioning and greater emotional lability and suggestibility. When the non-coronary group was compared with the total coronary group, no significant differences were found in their MMPI scores, but the 16 PF indicated that the coronary group were more independent in their social relationships, more suspicious of the motives of other people, and had greater feelings of inner tension.

A prospective study of coronary heart disease was initiated in 1960 by the Western Collaborative Group (9). Friedman and Rosenman, the leaders, had previously described an oral psychological questionnaire by which the specific behavior pattern of a subject could be classified as Type A or Type B. They considered that Type A was the coronary behavior pattern. It is characterized by excessive drive, aggressiveness, ambition, competitiveness and a sense of time urgency. They described Type B, on the other hand, as the relative absence of these characteristics. Answers to this questionnaire were part of the comprehensive data collected at intake on over 3,000 subjects. After two years, 54 of 1,584 Type A men and 16 of 1,593 Type B men had developed coronary heart disease, more than a threefold difference. After four and a half years, there is still a predominance of the Type A behavior pattern among the subjects who developed coronary disease, but the difference is less striking (48). It should be noted that a substantial number of Type B men *did* develop coronary disease; again the evidence suggests that at least two precoronary personality types are involved.

That there are at least two major types of coronary disease has been suggested by clinical studies, also. In two groups of men dying from coronary heart disease, for example, those diagnosed as having coronary disease at their last periodic health examination were compared with those whose heart disease was undetected at that time (49). The latter group was younger, and contained nearly twice as many heavy cigarette smokers and nearly twice as many men with hypercholesteremia as did the group with diagnosed heart disease. The facts that 1) both hypercholesteremia and heavy cigarette smoking have been more closely associated with death from coronary disease at younger than at older ages (cf. Table 20, p. 1405, ref. 6, 8, 49); 2) the anxiety-linked "coronary personality" was more often found in younger coronary patients by Bahnon and Wardwell, and 3) the preponderance of new coronary events in Type A subjects was greatest in

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Rosenman and Friedman's youngest age group, all tend to support Oliver's statement, "Indeed, there may be at least two major types of coronary disease—one associated with an active metabolic disorder and another associated with advancing age" (50).

Much remains to be done before the psychological factors underlying either the smoking habit or the coronary diathesis are fully understood, but it looks more and more as if the *kind of person* one is has to be taken into account. Whereas a decade ago, Hammond said, "there is as much reason to suppose that cigarette smoking causes nervous tension as to believe that nervous tension causes cigarette smoking," it now seems possible that both statements are true, but for different types of men, so that one uses smoking as an energizer, the other as a tranquilizer (51). Our own findings and those of others point to the existence of distinctive personality traits in cigarette smokers, on the one hand, and in precoronary individuals and coronary patients on the other. Inasmuch as a specific pattern of anxiety under stress was significantly related both to cigarette smoking and to parental coronary disease, anxiety appears to be one kind of common denominator (41, 43). In three studies, anxiety has been described as characterizing one of two groups of coronary patients or precoronary individuals—the *mother-oriented group* of Bahnson and Wardwell (46), the *angina group* of Ostfeld et al (47) and the *Type A behavior pattern* of Friedman and Rosenman (8). The familial occurrence of coronary heart disease has been documented, and points toward the involvement of genetic factors (52, 53). It seems likely that smoking habit patterns, too, are, to some extent, expressions of inborn differences. Intensive investigation of the sources and kinds of anxiety, and how destructive forms of anxiety can be identified and relieved may be the next important step in the prevention of coronary heart disease.

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